The Description of Information in 4-Dimensional Pseudo-Euclidean Information Space

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Abstract

This article is presented new method of description information systems in abstract 4-dimensional pseudo-Euclidean information space (4-DPIES) with using special relativity (SR) methods. This purpose core postulates of existence 4-DPIES are formulated. The theorem setting existence criteria of the invariant velocity of the information transference is formulated and proved. One more theorem allowed relating discrete parameters of information and continuous space-time treating and also row of supplementary theorems is formulated and proved. For description of dynamics and interaction of information, in article is introduced general parameter of information - generalized information emotion (GIE), reminding simultaneously on properties the mass and the charge. At performing calculation of information observable parameters in the information space is introduced continual integration methods of Feynman. The applying idea about existence of GIE as measures of the information inertness and the interaction carrier, and using continual integration methods of Feynman can be calculated probability of information process in 4-DPIES. In this frame presented approach has allowed considering information systems when interest is presented with information processes, their related with concrete definition without necessity. The relation between 4-DPIES and real systems parameters is set at modelling of matching between observable processes and real phenomena from information interpretation.

Key words: information space, information relativity, generalized information emotion, tensor of text, tensor of text perception
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1 Introduction

The consideration renderings of the information, the description of information dynamics and coursing processes at participation of the information, despite lacking a precise and unequivocal determination of the information are the important problems [1,2,3,4,5,6,7]. Importance of the problems related with a treating of the information is gathered in wide use of renderings about information processes in systems. In many frames as such information processes real physical and chemical processes act. However at a studying of information interchanges between systems there is a problem of studying of the most information process, instead of physical and chemical processes laying in its bottom is more often. The instances of such problems on studying of information systems can acting problems of generation, transfer and perception of information [1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20], for example; problems of relational databases modeling [21,22]; problems of a microbiology and biogenetic informatics [23,24,25,26,27,28,29,30,31]; studying of interaction of the information on logic and social systems development [32,33,34,35,36,37,38,39,40,41,42,43,44,45,46], in particular in particular closely related with objects cultural science [47,48,49,50,51,52] and linguistics [53,54,55,56,57,58,59,60].

In present time the core used approach is the treating of the information as measures entropy of source in which bottom the ideas tendered Sannon lay [8] the got developments in follow-on articles [9,10,11,12,13,14,15,16,17,18]. The bases of these approach attempts of information inclusion in treating physical systems, viewed in articles are undertaken [4,5,6,14]. In B.B.Kadomtseva's article [19] is presented the approach based on the analysis of irreversibility of the physical processes observed in system. Thus observed quantum-mechanical effects are identified with information processes [19,20].

The consideration of the information based on studying of properties of physical systems, there is a row of essential difficulties. First, the account of time characteristics of the information at not relativistic studying of physical, chemical, biological and social systems with which the information and methods of an information exchange is related provided that viewed systems are relativistic, so for example, the electromagnetic wave by means of which the information extends [4,5,6,19,20]. Secondly, difficulties in studying the information object and subject relation, as rule is attitudes object-subject allocation complexities [1,2]. Thirdly, complexities of the account of logical interference of the information which can be not always shown to properties of physical, chemical, biological and social systems.

In particular, the third complexity has led to a development of the device of discrete mathematics, boolean logic [32,33,34], and also L.A Zadeh's arti-

cles tendered in series ideas fuzzy sets, fuzzy logic [35,36,37] and linguistic variables [38,39]. On the basis of application of the device of logic and fuzzy logic attempts of thinking processes modelling in particular are undertaken [35,36,37,38,39,40,41,42,43,44,45,46].

In present articles the method of the information and information systems modelling is offered in some abstract information space, in this frame 4-dimensional pseudo-Euclidean information space (4-DPIES).

Introducing 4-DPIES can be proved that at description of information relate with real physical (chemical, biological, social, etc.) systems. Some processes and phenomena in this system is possible compare with three-dimensional coordinates, the time in real system identically to compare due course in information system.

The analogous situation takes place in case of physical systems relativistic description on the basis of fundamental symmetry properties. For example are mesons which relating two-body systems: quark and antiquark. In the relativistic approach generators of Poincare transformations group contact algebra physical observable [61,62]. The such articles are theoretical articles about inclusion of interaction operator in algebra observable in relativistic Hamiltonian dynamics (RHD) [62,63,64,65] and articles, devoted to studying of electroweak mesons properties in instant form RHD [66,67,68,69,70].

The information existing on the one hand as some objective reality, as existing physical (chemical, biological) system to which is related, in particular the electromagnetic wave by means of which transmission of the information is carried out. On the other hand generation and perception of the information depends on features of the subject of generation or perception of the information, on what in the articles specified A.N. Kolmogorov [13].

The introduction of information space comparison of real properties and processes of considered system to coordinate system, used is made at the description of behaviour of the information in information space. For relate of information space with physical system equivalence of time in physical system in due course in an information system is established, and for three-dimensional coordinates in information space relate with the phenomena or processes in real system which can be interpreted from the point of view of the description of the information as changes of coordinates is established.

This article consists of eight parts (paragraphs), in introduction is given brief field review where research methods on the basis of processes in information interpretation are widely applied consideration.

In the second part, the question of criterion existence is considered for introduction of invariant velocity of information transference in information space

and the basic postulates for information space. Existence of such velocity allows entering on 4-DPEIS of Poincare group transformation at transition from one frame of reference into another where as velocity of light in vacuum is used invariant velocity of information transference or *the light information velocity (LIV)*

In the third scientific article, general provisions of the description of kinematics of the information in 4-DPEIS are considered, and the criterion allowing are established to relate the discrete parameters of observable information displacement and the entered continuous information space.

In the fourth part, the description of information processes on the basis of representation about existence *the generalized information emotion* [19] is entered by formal forms. Entered thus *the generalized information emotion* is simultaneously inertial measure of information system (i.e. mass of system by physical analogy) and a measure of interaction (charge of system by physical analogy) on the basis of this introduction is possible to involve for the description of information processes in 4-dimensional space methods of Maxwell's electrodynamics [71,72,73,74]. The basic equations relating the general information parameters and entered in article *generalized information emotion* are postulated. All the processes related to generation and perception of the information, can be represented as interaction of one information on another due to interaction against each other *the generalized information emotions*, concerning to different information.

In the fifth part, the question on structure *the generalized information emotion* is considered. For a basis division of the information into the text, implied sense and a context is taken used in the theory of linguistics [53,54,55,56,57,58,59,60]. Thus for the description of the information in the form of the text is entered tensor of text any rank, and for the description of the subject of information perception is entered corresponding tensor of the information perception. The relating between the generalized information emotion and contributions from the text, implied sense and context of the existing information is established. For corresponding contributions relating between text and context are resulted by the account heterogeneity of continuous space-time and changes of corresponding contributions. From representation that implied sense is functionally dependent on the text, context and point of continuous space-time in which there is perception of the text, relate with implied sense and corresponding contributions from the text, context and point of continuous space-time is established. Introduction for the parameters of the information tensors of text, text perception, and also the generalized information emotion inherently is close to definition linguistic variable by means of which now are modelled information interaction of biogenetic [23,24,25,26,27,28,29,30,31] and processes responsible for system of logic and consciousness [32,33,34,35,36,37,38,39,40,41,42,43,44,45,46], and also cultures

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science and linguistics [47,48,49,50,51,52,53,54,55,56,57,58,59,60].

In the sixth part, being based on continual integration methods, offered Feynman [75] for calculation of probabilities of physical processes depending on observable and parameters of studied system, the question on probability of information processes course is considered [19] . At modelling information processes besides their likelihood character ambiguity modelling tensors of text and text perception, and also senselessness, within the limits of information problems, consideration of the free text without taking into account perception is considered. On the basis of the aforesaid the problem about free transference of the information (i.e. when transference and perception of the information are not interaction with other information), with calculation in general view of process probability and probability density is considered. The classification of possible problems is spent.

In the seventh part, using earlier considered for a frame of free information transference technique, frame in point on transference and interference between two and more information. The general problems which can be solved are considered, applying given methods.

In the eighth, final, parts generalization of the basic results are resulted and drawn conclusions on application of the given approach for the decision of the general-theoretical and practical problems related information processes.

2   The general postulates of the 4-DPEIS description

The information system in the article is understood as the information and space in which this information extends. At the description of information systems is necessary to set dimension of space, to enter frame of references and to define group of transformations of one frame of reference in another.

The time appears in modern methods of the information systems description as free parameter of system. It leads to that the account of system dynamics is represented complex and up to the end not resolved problem containing set of parameters, demanding a substantiation of introduction and criteria of admissible values selection [1,2,4,5,6,8,9,10,11,12,13,14,15,16,17,18].

The article is offered to construct 4-DPEIS where time is considered not as free parameter, and the coordinate of the given space directly compared in due course in real physical system to which the entered information space is related. Such space is 4-DPEIS on which and representation of Poincare transformations group, for the description of transition from one frame of reference the 4-dimensional coordinates grid (the coordinates grid is used time

and three spatial coordinates) is entered into another.

The general problem of such space introduction is existence or absence of the invariant velocity. By consideration of physical systems by such invariant velocity is velocity of light in vacuum — c [71]. The article is considered the information system in 4-DPEIS, for 4-DPEIS is obtained the criterion of invariant velocity existence. But before giving the formulation of the theorem proving existence of information transference invariant velocity is necessary made following rather important statement:

The postulate 1 is asserting existence of the minimal mean measured the distance value in information space: The minimal mean measured the distance value in information space is following value: $\lambda_c = 1$ bit [8,9,10,11,12,13].

The statement make in the postulate 1 was used at following theorem proof:

The theorem 1 is asserting necessary criteria of existence the invariant velocity of the information transference:

There is the invariant velocity of the information transference - the light information velocity (LIV) ν_c (the unit of the measure of the information velocity is bit per second) - which is related to the minimal mean measured of the distance value in information space λ_c (the value of the minimal mean distance in information space is established in the postulate 1) and fundamental physical constants [76,77]: the velocity of light in vacuum – c , Planck's constant – $\hbar$, the constant of gravitational interaction – G_N:

$$\nu_c = \sqrt{\frac{\lambda_c^2 \, c^5}{\hbar \, G_N}} \, ,$$

$$\nu_c = 1.6637 \times 2^{143} \, \frac{bit}{c}$$

(1)

The theorem 1 proof: *For the theorem proof is considered the physical system in which the electromagnetic wave extends with velocity of light in vacuum – c and the wave length to equal $\lambda = 2\,\ell_P$, where ℓ_P – is the length of Planck[1] . That frequency of the propagation wave is also invariant value ν_p, this is obvious:*

$$\nu_p = \frac{c}{2\,\ell_P},$$

(2)

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[1] The consideration of smaller length of a wave, for example, the value of the wave length equal to value of Planck's length $\lambda = \ell_P$, does not represent interest if considered logic of the information bit perception. For perception of information bit necessary to apprehend the physical signal (wave) equal to the semi-wave length, minimally possible value of measured which is equal to length of Planck in physical system [71,72,73,74].

Let by means of the electromagnetic wave is transferred some information, presented in the form of a binary code, for simplicity of reasoning and without restriction of the generality. In this frame, what transferred the information containing in one bit (according to statement made in postulate) is necessary transferred and accepted one semi-wave, as for recognition of one the information bit is enough accepted or transferred the semi-wave. In the given example by virtue of smallness the chosen the wave length conditionally is considered the point object — the material point is including in the quantity and the sense of the information. On the basis of above considered is possible made the following statement: physical transference of the information by means of the electromagnetic wave answers displacement of the information some bits number in information space; otherwise this statement is made so: for moving one bit of the information is necessary and enough moving the semi-wave in physical space. Hence the information velocity is proportional to frequency half of Eq. (2):

$$\nu_c \;=\; \frac{c\,\lambda_c}{\ell_P}\,, \tag{3}$$

If used formula for length Planck through fundamental physical constants: velocity of light in vacuum – c, Planck's constant – $\hbar$ the constant of gravitational interaction – G:

$$\ell_P \;=\; \sqrt{\frac{\hbar\,G_N}{c^3}}\,, \tag{4}$$

The having substitution the Eq. (4) in Eq. (3), gives the following Eq. (1) for LIV value.

In the considered example all parameters of a transferred electromagnetic wave were invariant, in any physical frame of reference. By virtue of it is approved: the length of a semi-wave is related with the information transferring in information space, transfer with invariant velocity of Eq. (1). The theorem is proved.

So, in conclusion of the paragraph, the general postulates are formulated in 4-DPEIS for systems consideration and realization of Poincare transformations group [71]:

The postulate 2 is asserting substantiation of the 4-DPEIS introduction: For any physical system (and not only physical) is entered related with this system 4-DPEIS: three-dimensional information space in which position of the information is set, and also time identically equal to time in physical system, linked to a considered intelligence system. The abstract 4-DPEIS entered in the article is continuous, as on time coordinates, so on space coordinates. Measured values are characterized by chance quantities, i.e. it is impossible approving the given value authentically true value.

The postulate 3 is asserting existence substantiations of inertial

frame of references: On the basis of in the theorem 1 approve, that there is the invariant velocity of the information transference in 4-DPEIS, certain by the equality $LIV — \nu_c$ in Eq. (1). In 4-DPEIS are inertial frame of references, in which LIV invariant value.

The postulate 4 is asserting substantiation of usage Poincare group transformations: In 4-DPEIS is entered representation of Poincare group, where as velocity of light in vacuum have used LIV.

3 Kinematics of the information in 4-DPEIS

There is no necessity detailed of consideration of the kinematics of information description question in abstract 4-DPEIS. Let's note only, that position of the information should be described by means of covariant (or contravariant) the 4-vector[2] of position – x^α and the corresponding 4-vector of velocity v^α. The 4-vector should be transformed with usage of Poincare group realization in which as invariant velocity is used $LIV – \nu_c$, at transition from one frame of reference to other frame of reference[71,72,73,74]:

$$x^\alpha = \left(x^0,\ x^1,\ x^2,\ x^3\right)\ .\tag{5}$$

The relativistic invariance consists in scalar product preservation at Poincare group transformations. At transition from one frame of reference in other frame of reference of the position 4-vector should be transformed on Poincare group representation, according in the postulate 4 has following obvious form for a 4-vector displacement transformation:

$$x'^\alpha = \Lambda^\alpha_\beta\, x^\beta + b^\alpha,\tag{6}$$

where Λ^α_β — is Lorentz's transformation matrix, b^α — is 4-vector of time-space displacement in 4-DPEIS.

In frame of if product of the 4-vector most on itself will turn out the following equality for its component, following of requirements of relativistic invariance is considered:

$$x^2 = x^\beta x_\beta = \left(x^0\right)^2 - \left(x^1\right)^2 - \left(x^2\right)^2 - \left(x^3\right)^2 = \nu_c^2\, \tau^2\,,\tag{7}$$

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[2] The hereinafter the Greek letters, for example, the indexes is α, β, etc., designate indexes with values 0, 1, 2, 3, and Latin letters, for example, by indexes is i, j, etc., designate indexes with values 1, 2, 3; besides for that after the repeated dummy indexes occurring once superscript and once subscript is supposed summation, except for the separate frames noted is meant in the text , thus takes in the account pseudo-Euclidean metrics, for the Greek letters from indexes.

where $x^0 = \nu_c\,t$ — is lights bit; t — is time in the laboratory system of reference, in conformity in the postulate 2 coincides in due course in physical system; $\nu_c\,\tau$ — is the 4-interval, invariant value; τ — is intrinsic time which, according to in the postulate 2 identically coincides with intrinsic time in considered physical system. From the received obvious kind of a square of the 4-interval in this frame have relation between infinitesimal time intervals in intrinsic system of references and laboratory system of references [71,72,73,74]:

$$\nu_c^2\,(d\,\tau)^2 = \nu_c^2\,(d\,t)^2 + \left(d\,x^1\right)^2 + \left(d\,x^2\right)^2 + \left(d\,x^3\right)^2. \tag{8}$$

The considering, that the derivative of coordinate on time in a laboratory system of reference is velocity of transference in the laboratory system of reference:

$$\frac{d\,x^i}{d\,t} = v^i, \tag{9}$$

The definition using of Eq. (9) is received for infinitesimal time intervals following relation [71]:

$$d\,\tau = d\,t\,\sqrt{1 + \left(v^1/\nu_c\right)^2 + \left(v^2/\nu_c\right)^2 + \left(v^3/\nu_c\right)^2}. \tag{10}$$

The value of 4-velocity define as the derivative of the information position 4-vector on intrinsic time [71]:

$$v^\alpha = \frac{d\,x^\alpha}{d\,\tau} = \frac{1}{\sqrt{1 - (v/\nu_c)^2}}\left(v^0,\ v^1,\ v^2,\ v^3\right),$$
$$v = \sqrt{(v^1)^2 + (v^2)^2 + (v^3)^2}, \tag{11}$$

where $v^0 \equiv \nu_c$ — is the time component of the 4-velocity. The scalar product of the 4-velocity is received following equation:

$$v^\alpha\,v_\alpha = \frac{1}{1 - (v/\nu_c)^2}\left[\left(v^0\right)^2 - \left(v^1\right)^2 - \left(v^2\right)^2 - \left(v^3\right)^2\right] \equiv \nu_c^2, \tag{12}$$

It is possible to enter the following dimensionless 4-vector which components are the 4-velocity attitude of Eq. (11) to value ν_c obtain by Eq. (1):

$$\beta^\alpha = \frac{v^\alpha}{\nu_c} = \frac{1}{\sqrt{1 - \beta^2}}\left(1,\ \beta^1,\ \beta^2,\ \beta^3\right),$$
$$\beta = \sqrt{(\beta^1)^2 + (\beta^2)^2 + (\beta^3)^2}, \tag{13}$$
$$\beta^i = v^i/\nu_c.$$

The considering kinematics of the information is necessary to pay attention to some contradiction arising by comparison of some postulates, resulted in the paragraph of 2. This question is necessary to consider more in detail. The

contradiction is noticeably if to consider statements in the postulate 1 and in the postulate 2. The invariant distance existence on the one hand affirms in information space, but on the other hand is considered the continuous information space-time. What to resolve this contradiction is necessary to pay attention to process of measurement of physical values which is averaging of the measured value [8,9,10,13]. If to take for a basis is received the given contradiction, the arising contradiction permission consists the mean values of the displacement 4-vector space components would be proportional to integers setting comparatively the invariant mean measured value in the postulate 1 [8,9,10,13].

The theorem 2   is of mean displacement in 4-DPEIS: *The invariant minimal displacement in information space, in any inertial frame of reference is the value λ_0 = 1 bit (it had according to the in the postulate 1). Space components of the 4-vector of mean displacement from the point x_a^α in the point x_b^α should is expressed through an integer of bits,*

$\langle \Delta x^\alpha \rangle = (\nu_c \langle \Delta t \rangle, N_1 \lambda_0, N_2 \lambda_0, N_3 \lambda_0)$, *where N_1, N_2, N_3 — are integers, $\langle \Delta t \rangle$ — is the mean time interval for which there is the displacement. By virtue of the given statement is received the following equality for the 4-vector of displacement (these is received equation for components of the given 4-vector) and 4-velocities:*

$$\langle \Delta x^\alpha \rangle = \nu_c \langle \int_{x_a^\alpha}^{x_b^\alpha} \beta^\alpha \, d\tau \rangle, \tag{14}$$

$$N_1 = \frac{\nu_c}{\lambda_0} \langle \int_{x_a^1}^{x_b^1} \frac{\beta^1}{\sqrt{1 - \beta^2}} \, d\tau \rangle,$$

$$N_2 = \frac{\nu_c}{\lambda_0} \langle \int_{x_a^2}^{x_b^2} \frac{\beta^2}{\sqrt{1 - \beta^2}} \, d\tau \rangle, \tag{15}$$

$$N_3 = \frac{\nu_c}{\lambda_0} \langle \int_{x_a^3}^{x_b^3} \frac{\beta^3}{\sqrt{1 - \beta^2}} \, d\tau \rangle,$$

$$\langle \Delta t \rangle = \frac{\lambda_0^2}{\sqrt{\langle v^2 \rangle}} \sqrt{N_1^2 + N_2^2 + N_3^2},$$

where the value $\langle v^2 \rangle$ is an mean from v^2, certain according to the Eq. (11), and τ – intrinsic time of system.

The theorem 2 proof: *The proof of the given theorem has been lead to two steps. The first have proved equalities for space components of the displacement*

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4-vector. Without restriction of a generality have considered displacement of the information along one axis, for example is axis of x^1. The velocity of displacement of the information along this axis, at the relativistic description have designated for convenience u^1:

$$u^1 = \nu_c \frac{\beta^1}{\sqrt{1 - \beta^2}} .$$ (16)

The displacement from a point x_a^1 in the point x_b^1 should be expressed by following integral from velocity along the axis x^1:

$$\Delta x^1 = x_b^1 - x_a^1 = \int_{x_a^1}^{x_b^1} u^1 \, d\tau = \nu_c \int_{x_a^1}^{x_b^1} \frac{\beta^1}{\sqrt{1 - \beta^2}} \, d\tau .$$ (17)

The considering 4-velocities scalar product obvious form of Eq. (11) and 4-velocity vector component of Eq. (13) at statement of Eq. (17) is received following integral:

$$\Delta x^1 = \int_{x_a^1}^{x_b^1} v^1 \, dt ,$$ (18)

where $t-$ is time in a laboratory frame of reference.

The continuous change of component of the displacement vector along the axis x^1 should be casual parameter (see in the postulate 2), therefore measured displacement should be mean displacement calculated on rules of calculation of a continuous random variable, not concretizing the form of the random variable probability density (to the question of calculation of density should be return later, considering dynamics of the information), should be calculate an mean displacement:

$$\langle \Delta x^1 \rangle = \langle \int_{x_a^1}^{x_b^1} v^1 \, dt \rangle .$$ (19)

By virtue of in the postulate 1 the measured invariant mean displacement value is the value $\lambda_0 = 1$ bit, therefore any mean displacement along any space axis in considered 4-DPEIS should be proportional to the integer of bits. If to assume is received contradiction, that λ_0 is not invariant value that contradicts in the postulate 1. Therefore is received, that any mean displacement is proportional to the integers of bits:

$$\langle \Delta x^1 \rangle = N_1 \lambda_0 .$$ (20)

From this equality in view of Eqs. (17)–(20) should be turned out demanded

equality for component of x^1 Eq. (15):

$$N_1 = \frac{\nu_c}{\lambda_0} \langle \int_{x_a^1}^{x_b^1} \frac{\beta^1}{\sqrt{1-\beta^2}} \, d\tau \rangle. \tag{21}$$

The analogously is possible to prove validity of the statement about proportionality of components to the integer of bits for the remained space components of the mean displacement vector in Eq. (15).

The second stage of the proof should be the proof of a equality for mean time, thus consider, that equalities for all space coordinates are already proved by us. So, should be calculate mean value from time component of a 4-vector of displacement:

$$\Delta x^0 = x_b^0 - x_a^0 = \nu_c \int_{x_a^0}^{x_b^0} \frac{1}{\sqrt{1-\beta^2}} \, d\tau \tag{22}$$

$$\Delta x^0 = \nu_c \, [t_b - t_a] = \nu_c \, \Delta t.$$

The mean time interval should be received as random value:

$$\langle \Delta x^0 \rangle = \nu_c \, \langle \Delta t \rangle. \tag{23}$$

The 4-interval definition of Eq. (5) took advantage, and the 4-interval should be calculated for the mean displacement 4-vector of Eq. (14):

$$[\nu_c \, \langle \Delta\tau \rangle]^2 = [\nu_c \, \langle \Delta t \rangle \,]^2 - [N_1 \, \lambda_0]^2 - [N_2 \, \lambda_0]^2 - [N_3 \, \lambda_0]^2. \tag{24}$$

This of Eq. (24) is transformed and led to following form:

$$\left[\langle \Delta t \rangle^2 - \langle \Delta\tau \rangle^2 \right] = \left(\frac{\lambda_0}{\nu_c}\right)^2 \left[N_1^2 + N_2^2 + N_3^2\right]. \tag{25}$$

For calculation of mean values in the left part of Eq. (25) uses relate between time intervals in laboratory and intrinsic frame of references (this frames of references is considering inertial frame of references) [71,73]:

$$\Delta\tau = \Delta t \sqrt{1-\beta^2}, \tag{26}$$

where β the resultant equation for relate of the information is certain by mean time of displacement Eq. (13), as the result of averaging the given equation and substitution of result in Eq. (25):

$$\langle \Delta t \rangle = \frac{\lambda_0}{\sqrt{\langle v^2 \rangle}} \sqrt{N_1^2 + N_2^2 + N_3^2}. \tag{27}$$

The Eq. (27) coincides with equation for time component set in Eq. (15). The theorem is proved.

4 Dynamics and parameters of the information

For the description of dynamics of the information should be necessary made the assumption that key parameter of dynamics and interaction is *the GIE — Q*. The *GIE* parameter is simultaneously analogue mass a physical body, i.e. acts as a measure of inertia, and analogue of an electric charge, i.e. acts in a role of a source of the field of interaction. The using this assumption, for the description of the field generated by interaction Q on other information objects is possible to enter formally 4-vector potential, having defined through a 4-interval and 4-velocity:

$$A^{\alpha} = \left(A^0, \ A^1, \ A^2, \ A^3\right), \tag{28}$$

where A^0— is the time component, A^1, A^2, A^3 — are space components of a 4-vector of potential which obvious kind should be certain from conditions of a solved problem. The notice is necessary , that components of the given vector depend on parameter of the information transference and parameter of the information interference, including from entered in the formal form *the GIE*. What to calculate an obvious kind of components of a 4-vector of interference potential was apply a technique of the vector potential calculation used in electrodynamics, being based on the made assumption. The considering this technique was enter the differential operator whom was name 4-divergence, written out accordingly in covariant and contravariant forms [71,72,73,74]:

$$\begin{aligned}
\partial_{\alpha} &= \left(\frac{\partial}{\partial x^0}, \ -\frac{\partial}{\partial x^1}, \ -\frac{\partial}{\partial x^2}, \ -\frac{\partial}{\partial x^3}\right), \\
\partial^{\alpha} &= \left(\frac{\partial}{\partial x_0}, \ \frac{\partial}{\partial x_1}, \ \frac{\partial}{\partial x_2}, \ \frac{\partial}{\partial x_3}\right).
\end{aligned} \tag{29}$$

The vector potential A^{α} should be used allowed to construct antisymmetric the second rank tensor [71,72,73,74]:

$$G^{\alpha\beta} = \left(\partial^{\alpha} A^{\beta} - \partial^{\beta} A^{\alpha}\right), \tag{30}$$

The antisymmetric tensor of Eq. (30) has allowed to construct dual tensor, by a following rule:

$$\tilde{G}^{\alpha\beta} = \frac{1}{2} \varepsilon^{\alpha\beta\varrho\sigma} G_{\varrho\sigma}, \tag{31}$$

where ε — antisymmetric 4 ranks Levy-Chivita tensor [71,72,73,74]. By analogy to the description of the electromagnetic field is possible formally has been

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written out the set of equations describing generated by the *GIE* which in this frame acted as the electric charge. The current density was enter formally 4-dimensional vector [71,72,73,74]:

$$j^{\alpha} = \left(j_{\rho}^{\,0}, \; j_{\rho}^{\,1}, \; j_{\rho}^{\,2}, \; j_{\rho}^{\,3} \right),$$ (32)

Which components are in detail considered further. That considered Q by virtue as the charge could formally have demanded from performance of the the charge preservation law, in this frame received for a 4-dimensional vector of current density following formal equation [71,72,73,74]:

$$\partial^{\alpha} j_{\alpha} = 0.$$ (33)

The formal set of equations is as a result written out, relating vector 4-potential with the source of the field generated by this potential, presented by formally entered 4-vector of current density [71,72,73,74]. By analogy to electrodynamics have received set of Maxwell's equations, including, that as well as in electrodynamics of component of a 4-vector of potential consider as the contributions caused by presence of sources (i.e. is the *GIE*), and the contributions which are not having such sources, and describing movement of the specified sources in information space:

$$\begin{cases} \dfrac{1}{2}\,\partial_{\alpha}\,G^{\alpha\beta} = 4\pi\,j^{\beta}, \\[2mm] \dfrac{1}{2}\,\partial_{\alpha}\,\tilde{G}^{\alpha\beta} = \quad 0 \quad. \end{cases}$$ (34)

The first equation in the given system has allowed to specify in an obvious kind of component of a 4-vector of the potential, linked with sources of the generated field a source Q, the second equation has allowed to describe components of a 4-vector of potential for which there is no source. The such formal introduction and written out equations Maxwell by analogy to electrodynamics system made properties of a 4-vector of potential and a 4-vector of current density are in detail considered.

On the 4-vector of potential are adjusted following requirements: first, this requirement of invariancy of potential of interference for any frame of reference; in the second, this requirement of decrease of potential eventually and depending on remoteness from a source in space, in a basis of this requirement is necessary supervision that interaction of the information weakens depending on increase in a time interval and its remoteness from a source of the information. On the basis of these requirements the following statement, potential inversely proportional to a 4-interval certain by Eq. (7), is made, and is directly proportional Q as to a source of the field, in this frame the potential

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is presented by following equation:

$$A^\alpha = \frac{Q}{x^2} \, a^\alpha \,,$$

$$A^\alpha = \frac{Q}{x^2} \left(a^0, \, a^1, \, a^2, \, a^3 \right) ,$$

(35)

where a^0, a^1, a^2, a^3 — are dimensionless components which obvious forms defines from the decision of the set of equations Eq. (34).

The having considered, the operator a 4-vector of current density of Eq. (32), have received, that as the $GIE — Q$ borrows 4-volume by virtue consider density of the GIE follows as 4-density:

$$\rho_Q = \frac{d\,Q}{d^4\,x} \,,$$

(36)

where $d^4\,x$ — is a differential 4-volume of information space:

$$d^4\,x = d\,x^0 \; d\,x^1 \; d\,x^2 \; d\,x^3 \,,$$

(37)

On the basis of definition of 4-density of the GIE is redefined the 4-vector of current density, having selected obviously dependence on 4-density of the GIE:

$$j^\alpha = \frac{d\,Q}{d^4\,x} \left(j^0, \, j^1, \, j^2, \, j^3 \right) ,$$

(38)

where j^0, j^1, j^2, j^3 — is dimensionless components of a 4-vector of current density which obvious forms should be certain from the decision of the equations set Eq. (34).

The now have considered information dynamic parameter have entered the analogue of 4-vector of momentum for the information system. For this purpose 4-velocity definition of Eq. (11) and the value of the GIE entered earlier by us is used:

$$p^\alpha = Q\,v^\alpha \,.$$

(39)

Through introduced by us value potential 4-vector of Eq. (35) and the 4-vector of momentum Eq. (39), have written out Lagrangian systems. First appointed Lagrangian for free information system in form [71,73]:

$$\mathfrak{L}_0 \left(x^\alpha, v^\alpha \right) = -p^\alpha \, v^\alpha = -\,Q\,v_\alpha \, v^\alpha = -Q\,v_c^2 \,.$$

(40)

The sort of Lagrangian is dictated by a requiring of minimality Lagrange action integral determine as integral on intrinsic time from Lagrangian at the displacement of the information from the point x_a^α in the point x_b^α information space [71,73]:

$$S_0 \left(x_a^\alpha, x_b^\alpha \right) = \int \mathfrak{L}_0 \left(x^\alpha, v^\alpha \right) \, d\,\tau = -\int Q\,v_\alpha \, d\,x^\alpha \,.$$

(41)

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If movement of the information, described by the $GIE - Q_1$ was implemented under interaction of other information, described the $GIE - Q_2$, then Lagrangian has accepted resulting form:

$$\mathcal{L}_{int}(x^\alpha, v^\alpha) = -(Q_1 + Q_2)[f\, v_\alpha + A_\alpha]\, v^\alpha, \tag{42}$$

where the dimensionless multiplier f was introduced for convenience of a designation and equal:

$$f = \frac{1}{2}\left[1 + \frac{Q_1 - Q_2}{Q_1 + Q_2}\frac{u^\alpha v_\alpha}{\nu_c^2}\right], \tag{43}$$

and the 4-velocities v^α and u^α were defined in velocities of the first information v_1^α and the second information v_2^α in a following form:

$$\begin{cases} v^\alpha = (v_1^\alpha + v_2^\alpha), \\ u^\alpha = (v_1^\alpha - v_2^\alpha), \end{cases} \tag{44}$$

The 4-vector of potential A^α interferences in this frame was defined by following equation:

$$A^\alpha = \frac{Q_{12}}{x^2}\left(a^0,\, a^1,\, a^2,\, a^3\right), \tag{45}$$

where the GIE used potentially Q_{12} was expressed through each information emotions Q_1 and Q_2:

$$Q_{12} = \frac{Q_1\, Q_2}{(Q_1 + Q_2)}, \tag{46}$$

Using equations for Lagrangian interferences of information Q_1 and Q_2 of Eq. (42), in view of Eqs. (43)–(46) for Lagrange action integral have got resulting obvious form:

$$S_{int}(x_a^\alpha, x_b^\alpha) = \int \mathcal{L}_{int}(x^\alpha, v^\alpha)\, d\tau,$$
$$S_{int}(x_a^\alpha, x_b^\alpha) = -\int (Q_1 + Q_2)[f\, v_\alpha + A_\alpha]\, d x^\alpha. \tag{47}$$

The having written out, thus Lagrangian interferences of information, the question on dimension of the GIE and a component of a 4-vector of potential of interference is solved. Was plainly, that components of a 4-vector of potential of interference should index on dimension with the information 4-velocity ofEq. (42) – [bit/c]. The obvious form of the interference potential 4-vector of Eq. (35) indicates on that fact, that dimension a component of a 4-vector of potential of interference inversely proportional the bit in a square – [bit^2]. Hence, dimension of the GIE is got – [bit^3/c], i.e. the three-dimensional volume of the information in unit of time, thus indicates a meaning of the GIE on that the given information is perceived, or not. The problem having considered on dimension of the GIE, it is possible to consider the problem on existence of the

invariant *GIE* and about its relation with any other *GIE*. The *GIE* admissible meanings question treating was do on the basis of that the given value is the characteristic of interaction. The *GIE* is similar to a charge, it can differ a sign (thus it is supposed, that the same emotions are drawn, and heteronymic make a start, has been more in detail view this question below). The measure of the *GIE* invariant existence and mutual relation with any other meaning of emotion is the following theorem:

The theorem 3 is asserting $GIE - Q_c$ **dimension constant existence and restriction criterions:** *There is constant measured value in 4-DPEIS the minimal mean distance* λ_c, *hence, there is a constant measured minimal mean volume* λ_c^3, *means it is possible to define a constant, on dimension indexing with the introduced GIE, and to express it through* λ_c *fundamental manual constants [76,77]: velocity of light in vacuum – c, Planck's constant –* $\hbar$, *the constant of gravitational interaction –* G_N. *The GIE dimension constant have obvious form:*

$$Q_c = \sqrt{\frac{\lambda^6 \, c^5}{\hbar \, G_N}} \, ,$$

$$(48)$$

$$Q_c = 1.6637 \times 2^{143} \, \frac{bit^3}{c} \, .$$

Thus any GIE where following designations are entered for each information parameters with the Q_1 *and* Q_2 *– are the GIE and also them combinations of these parameters corresponding: gathered in invariant unit volume* $\lambda_c^3 = 1 \, bit^3$, *apprehended for some time interval, it is related with a constant of dimension of the GIE a following inequality:*

$$|Q| \leqslant Q_c \, .$$

$$(49)$$

The theorem 3 proof: *The proof of the theorem are conducted in two stages the question on existence of an invariant value, on the dimension indexing with emotion, first, is viewed. As there is an mean minimal distance* λ_c, *accordingly if three space measurements along each of coordinates axes received have been taken, that the considered volume* $\lambda3_c$ *will be too constant. If the given volume has been apprehended for a time interval equal Planck's to time* t_P, *the following value certain as result:*

$$Q_c = \frac{\lambda_c^3}{t_P} \, ,$$

$$(50)$$

Was plainly, should be a constant in any system of readout, on dimension will index with introduced before the GIE (see, for example, a determination Lagrangian of free transference information of Eq. (40) and Lagrangian of interference information of Eq. (40) in information space).

The considering fundamental physical constants: velocity of light in vacuum c, Planck's constant $\hbar$, *gravitational constant G can be made equation for*

Planck's time:

$$t_P = \sqrt{\frac{\hbar\, G_N}{c^5}}\,, \tag{51}$$

The substituting Eq. (51) in Eq. (50) have received the demanded equation for GIE of Eq. (48).

Secondly, the GIE concluded in invariant unit 3-volume, equal λ_c^3 of Eq. (50) has been considered, let could be apprehended for some any time interval Δt, in this frame emotion could be equal, including on the module:

$$|Q| = \frac{\lambda_c^3}{\Delta t}\,. \tag{52}$$

If the following limit could be calculated:

$$\lim_{\Delta t \to t_P} |Q| = \lim_{\Delta t \to t_P} \frac{\lambda_c^3}{\Delta t} = Q_c\,. \tag{53}$$

The apparently in limit the value of size received at the first stage of the proof has turned out. The GIE inversely proportional on a time interval received, that with increase in a time interval value of GIE decreases. The Planck's time t_P — is minimal measurable physical time interval, there Q_c — is the greatest possible value GIE concluded in unit 3-volume λ_c^3. Thus, received validity of the statement Eq. (49). The theorem is proved.

The *GIE* dimension constant existence criterion established in in the theorem 3, and also relate with the *GIE* concluded in unit 3-volume λ_c^3, has allowed to make following transformations to considered potential. The potential was sent dimensionless values. The *GIE* definition at a 4-vector of potential of Eq. (35) have defined as follows, through constant of *GIE* of Eq. (35):

$$Q = Q_c\, n\,(x^\alpha)\, q\,(x^\alpha)\,, \tag{54}$$

where $n\,(x^\alpha)$ — is the number of elementary volumes λ_c^3 which are borrowed with the given information in information space; $q\,(x^\alpha)$ - there is the dimensionless function describing perception of the information on value. This function only one requirement, it should be invariant of concerning Poincare group transformations. The square of a 4-interval was entered following definition:

$$x^2 = \lambda_c^2\, [s\,(x^\alpha)]^2\,, \tag{55}$$

where $s\,(x^\alpha)$ - the dimensionless function numerically equal to value of a 4-interval. On the basis of the given transformations of Eq. (54) and Eq. (55) is received, the 4-vector of potential gets demanded dimension in obvious form:

$$A^\alpha = \nu_c\, n\,(x^\alpha)\, \frac{q\,(x^\alpha)}{[s\,(x^\alpha)]^2}\, a^\alpha\,, \tag{56}$$

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The 4-vector of momentum has similarly redefined, using Eq. (13) and Eq. (54):

$$p^{\alpha} \;=\; Q_c \, \nu_c \, n \left(x^{\alpha} \right) \, q \left(x^{\alpha} \right) \, \beta^{\alpha} \,, \tag{57}$$

The result, for Lagrangian of free transference information of Eq. (40) and Lagrangian of interference information of Eq. (42) were received following equations:

$$\mathfrak{L}_0 = - \, Q_c \, \nu_c^2 \, \left[n \left(x^{\alpha} \right) \, q \left(x^{\alpha} \right) \, \beta^{\alpha} \, \beta_{\alpha} \right] \,,$$

$$\mathfrak{L}_{int} = - \, Q_c \, \nu_c^2 \, \left(n_+ \, q_+ \, \left[f \, \beta_{\alpha +} + \frac{q_{12}}{\left[s \left(x^{\alpha} \right) \right]^2} \, a^{\alpha} \right] \beta_+^{\alpha} \right) \,, \tag{58}$$

where following designations are entered for each information parameters with the Q_1 and Q_2 — are the *GIE* and also them combinations of these parameters corresponding:

$$n_+ \;=\; n_1 \left(x^{\alpha} \right) \, n_2 \left(x^{\alpha} \right) \,,$$

$$q_+ \;=\; \frac{1}{n_2} \, q_1 \left(x^{\alpha} \right) \,+\, \frac{1}{n_1} \, q_2 \left(x^{\alpha} \right) \,,$$

$$q_- \;=\; \frac{1}{n_2} \, q_1 \left(x^{\alpha} \right) \,-\, \frac{1}{n_1} \, q_2 \left(x^{\alpha} \right) \,,$$

$$q_{12} \;=\; \frac{q_1 \left(x^{\alpha} \right) \, q_2 \left(x^{\alpha} \right)}{q_+ \left(x^{\alpha} \right)} \,, \tag{59}$$

$$f \;=\; \frac{1}{2} \, \left[1 \,+\, q_{\pm} \, \beta_-^{\alpha} \, \beta_{\alpha +} \right] \,,$$

$$q_{\pm} \;=\; \frac{q_-}{q_+} \,,$$

$$\beta_+^{\alpha} \;=\; \beta_1^{\alpha} \,+\, \beta_2^{\alpha} \,,$$

$$\beta_-^{\alpha} \;=\; \beta_1^{\alpha} \,-\, \beta_2^{\alpha} \,.$$

The theorem 4 is asserting existence of the information constant $\hbar_c$:
The information constant $\hbar_c$ value is expressed through fundamental physical constants [76,77], such as Planck's constant - $\hbar$, velocity of light in vacuum - c, with a constant of gravitational interaction - G_N and constant of the minimal average displacement in information space λ_c in the following form:

$$\hbar_c \;=\; \frac{\lambda_c^5 \, c^5}{2 \, \pi \, \hbar \, G_N} \,,$$

$$\hbar_c \;=\; 1.7621 \times 2^{284} \, \frac{bit^5}{c^2} \,. \tag{60}$$

The theorem 4 proof: *For the proof of the given theorem has been considered the analogy to physical system. As is known from quantum physics,*

if in this frame was considered a particle in intrinsic frame of reference, for rest elementary particle with nonzero rest mass was possible according to representation about wave-corpuscular dualism [4], to write down the following equation:

$$\hbar\,\omega \;=\; m\,c^2\,,\qquad\qquad(61)$$

where ω – is a cyclic frequency, m – is rest mass of a particle. Thus, have received, that on dimension Planck's constant $\hbar$ is directly proportional to mass of a particle, velocity of light in vacuum and time, since inversely proportional to cyclic frequency. This analogy is used at calculation of information constant. That was received by virtue the information constant should be expressed through a constant of emotion, the LIV and Planck's time:

$$\hbar_c \;=\; \frac{1}{2\,\pi}\,Q_c\,\nu_c^2\,t_P\,.\qquad\qquad(62)$$

The fundamental physical constants have considered velocity of light in vacuum c, constant Planck $\hbar$, gravitational constant G_N of which the obvious form for Planck's time of Eq. (51). The substituting Eq. (51) for Planck's time has been made an obvious forms by the constant GIE of Eq. (48) and Eq. (1) for LIV in the received of Eq. (62). The relate between information constant and fundamental physical constants have received of Eq. (60). The theorem is proved.

It will be in summary rebuked about that the considered way of the account of interference not unique. The interaction inclusion will be possible to use offered P.A.M. Dirac ways of direct interaction inclusion in algebra observable. The P.A.M. Dirac article [61] has offered three most economical ways of direct interaction inclusion in the observable algebra which have received the name of dynamics forms: light front, instant and point. Forms of dynamics differ observable including interaction and kinematics subgroups (observable independent from interaction). The application of such approach on inclusion of interaction can be useful by consideration of the general properties of systems, in particular at construction of theories of dynamics and interference of the information, under conditions not preservations of a charge or the description of the related conditions [62,63,64,65]. In particular, the technique developed within the limits of the instant form of dynamics [66,67,68,69,70] can be adapted for the description of information interactions.

5   The GIE structure

The one of key model elements is formally entered *GIE* [53,54,55,56,57,58,59,60], which simultaneously represents the measure of the information inertia (*GIE* acts in a mass role if to result physical analogy, at definition of kinematics

values) and the measure of interaction (*GIE* acts in a charge role at definition of interaction potential 4-vector analogue). Such formal introduction later is validated, for this purpose are discussed contributions to *GIE* of the information various components:*the text* — is μ, the contribution given *text* in *context* — is ψ and *implied sense* — is γ, resulting interaction of the given text with a context [53,54,55,56,57,58,59,60]. The later on the *GIE* dimensionless part — q, accordingly is considered and all contributions to the *GIE* were considered as dimensionless value:

$$q \;=\; \mu \;+\; \gamma \;+\; \psi\,, \tag{63}$$

The basis of definition, for the generalized information emotion (54) through a dimensionless part q which is presented in the paragraph 4, the statement is possible make, according to output in the theorem 3, that is defined by following restriction $|q| \leq 1$. The notice is necessary , that in this frame it is possible to attribute conditional values q in which have been reflected logic character of values q: $q \;=\; 1$ - value *true* is attributed, $q \;=\; -1$ - value is attributed *false*, $q \;=\; 0$ - is attributed value *uncertain*, i.e. not *true* and not *false*.

For what to enter function of emotion, it was necessary consider the information representation. There are two basic ways of the information representation: or in the form of entropy source [8,9,10,11,12,13,14,15,16,17,18]; or in the logic functions form and the operations certain above them [32,33,34,35,36,37,38,39,40,41,42,43,44,45,46 The complexity of such definitions usage consists: first, this was difficult considered subjects properties of the information generation or perception (the subjects properties was depended correctness information generation or perception), secondly, in approach of Shannon [8,9,10] was difficultly considered the information logic component, thirdly, in structurally-logic approaches, in particular, in fuzzy logics [35,36,37,38,39,40,41,42,43,44,45,46], was complicated consideration of questions on generation and the information dynamics.

In the given article is offered set the information in the any rank tensor form, which components are responsible for the information representation in the initial characters form (in simple frame is the letter), the text symbolical designs (symbolical designs is the words having certain value in the given text), the basic ways of construction of the information structure (grammatical and semantic rules on which are under construction the basic offers), rules of construction and perception of separate phrases, etc. notice at once is necessary, that given way of the information job is not unequivocal, but allows to consider not only features of the given the information representation, but also subjective features as information and perception of this information.

By consideration of the text contribution is necessary for us to consider three objective circumstances. First, the text generally will present in any rank tensor form [12,21,22]: components of data tensor contain signs on the text (for example letters), features of its punctuation, author's style, etc. If without the

generality restriction was considering not the verbal level then tensor compo-
nents contain certain characters perceived entirely (for example inarticulate
sounds or emotional gestures). At transition from one frame of reference in
other frame of reference the tensor of text will be transformed under the fol-
lowing law, that is had 4^m component:

$$\hat{T}^{\,\alpha_1,\,\alpha_2,\,\dots,\,\alpha_{m-1},\,\alpha_m} \;=\; \Lambda^{\,\alpha_1}_{\,\beta_1}\,\Lambda^{\,\alpha_2}_{\,\beta_2}\;\dots\;\Lambda^{\,\alpha_{m-1}}_{\,\beta_{m-1}}\,\Lambda^{\,\alpha_m}_{\,\beta_m}\,\hat{T}^{\,\beta_1,\,\beta_2,\,\dots,\,\beta_{m-1},\,\beta_m}\;. \qquad (64)$$

Secondly, for the text perception is necessary to possess the tool on perception
[47,48,49,50,51,52]. As such tool can act tensor the text perception which
components comprise signs which probably to apprehend, rules of perception
of the text, etc. (i.e. characterizes features of the subject of the information
perception [47,48,49,50,51,52]). The dimension of tensor of text perception
should be not less than the perceived text, i.e. 4^m-component. At transition
from one frame of reference in other frame of reference of transformation occur
by rules of tensor transformation:

$$\hat{D}^{\,\alpha_1,\,\alpha_2,\,\dots,\,\alpha_{m-1},\,\alpha_m} \;=\; \Lambda^{\,\alpha_1}_{\,\beta_1}\,\Lambda^{\,\alpha_2}_{\,\beta_2}\;\dots\;\Lambda^{\,\alpha_{m-1}}_{\,\beta_{m-1}}\,\Lambda^{\,\alpha_m}_{\,\beta_m}\,\hat{D}^{\,\beta_1,\,\beta_2,\,\dots,\,\beta_{m-1},\,\beta_m}\;. \qquad (65)$$

Thirdly, interaction between two various texts was carried out as interaction
between scalars in the chosen point in 4-DPEIS, on the basis can defined
scalar value *the text emotion*, such value can be carried out by convolution
initial tensor of text with tensor of text perception and averaging on number
of tensor of text components:

$$\mu = \frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\;Q_c}\left[\hat{D}^{\,\alpha_1,\,\dots,\,\alpha_m}\,\hat{T}_{\alpha_1,\,\dots,\,\alpha_m} + \hat{T}_{\alpha_1,\,\dots,\,\alpha_m}\,\hat{D}^{\,\alpha_1,\,\dots,\,\alpha_m}\right]\;, \qquad (66)$$

where μ — is *the text emotion*; Q_c - is the generalized information emotion
dimension constant, which value of Eq. (49) is certain according to in the the-
orem 3; $n\,(x^{\,\alpha})$ - is elementary volumes number borrowed by the information
in information space. The two tensors general property should be such that
at transition from one frame of reference in 4-DPEIS in other system *the text
emotion* remained invariant value for the given concrete point in 4-DPEIS.

The text and text perception is characterized not only tensors of Eq. (64)
and Eq. (65), but also change and heterogeneity component in 4-DPEIS. For
that what to consider the text changes and heterogeneity, could be entered
following text deformations tensor which is defined by the operator - tensor
heterogeneity of the text on components with an index ν:

$$\hat{T}^{\,\alpha_1,\,\dots,\,\alpha_m}_{;\,\nu} \;=\; \frac{1}{2}\left(\lambda_c\,\partial_\nu\,\hat{T}^{\,\alpha_1,\,\dots,\,\nu,\,\dots,\,\alpha_m}\right)\;. \qquad (67)$$

The dimension received tensor of Eq. (67) differs from tensor of text Eq. (64),
tensor of Eq. (67) contains 4^{n-1} component. These perceived changes is pos-
sible only having processed changes of the text by the device means the text

perception as which is used the tensor of text perception, as tensors of Eq. (65) and Eq. (67) convolution result is received some 4-vector value which influences the given text perception:

$$
I^{\nu} = \frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\ Q_c} \sum_{\nu=\alpha_1}^{\alpha_m} \left(\hat{T}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m}\ \hat{D}_{\,\alpha_1,\,\ldots\,,\,\nu,\,\ldots\,,\,\alpha_m} \right) +
$$
$$
\frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\ Q_c} \sum_{\nu=\alpha_1}^{\alpha_m} \left(\hat{D}_{\,\alpha_1,\,\ldots\,,\,\nu,\,\ldots\,,\,\alpha_m}\ \hat{T}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m} \right). \tag{68}
$$

The index ν in Eq. (68) runs all possible values from α_1 up to α_n inclusively. The Eq. (68) is averaging on all possible changes and heterogeneity component in 4-DPEIS. The besides changes and heterogeneity text might be inherited changes and heterogeneity components of tensor of text perception, acting on analogy with tensor of texts, could enter tensor of the text heterogeneity perception on index ν:

$$
\hat{D}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m} = \frac{1}{2} \left(\lambda_c\,\partial_{\,\nu}\,\hat{D}^{\,\alpha_1,\,\ldots\,,\,\nu,\,\ldots\,,\,\alpha_m} \right). \tag{69}
$$

The entered tensor of Eq. (69) by means, at convolution with tensor of Eq. (64) and the subsequent averaging on all possible values of components with every possible values of an index ν, the perceived text distortions 4-vector, caused by the text perception changes related with changes and heterogeneity tensor of text perception has turned out as a result. It is supposed, that all changes and heterogeneity of the tensor of text perception are related to influence on context, the received vector - will refer to as a vector of context stream:

$$
B^{\nu} = \frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\ Q_c} \sum_{\nu=\alpha_1}^{\alpha_m} \left(\hat{D}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m}\ \hat{T}_{\,\alpha_1,\,\ldots\,,\,\nu,\,\ldots\,,\,\alpha_m} \right) +
$$
$$
\frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\ Q_c} \sum_{\nu=\alpha_1}^{\alpha_m} \left(\hat{T}_{\,\alpha_1,\,\ldots\,,\,\nu,\,\ldots\,,\,\alpha_m}\ \hat{D}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m} \right). \tag{70}
$$

The tensors of Eq. (67) and Eq. (69) also by facility is defined one more scalar value which is referred to as the basic the text to context contribution:

$$
\psi_0 = \frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\ Q_c} \sum_{\nu=\alpha_1}^{\alpha_m} \hat{T}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m}\ \hat{D}_{\,\alpha_1,\,\ldots\,,\,\alpha_m;\,\nu} +
$$
$$
\frac{2^{-(2\,m+1)}}{n\,(x^{\,\alpha})\ Q_c} \sum_{\nu=\alpha_1}^{\alpha_m} \hat{D}_{;\,\nu}^{\,\alpha_1,\,\ldots\,,\,\alpha_m}\ \hat{T}_{\,\alpha_1,\,\ldots\,,\,\alpha_m;\,\nu}. \tag{71}
$$

The implied sense on the one hand and the text at interaction with context cannot exist the friend without the friend, in other words the text at interaction with context generates implied sense or on the contrary appeared implied

sense generates some new text at context invariance, or changes the initial text changing the contribution to context. The account of mutual the text and implied sense influence, allows revealing heterogeneity of the text in view of text and context streams. The define 4- divergence is possible as 4-vector of the text stream of Eq. (29) and also to calculate antisymmetric tensor and dual to it tensor. These generally values are not equal to zero. Thus, for preservation without dimension of entered values, up to multiply the differential operator 4- divergence on constant mean value of distance λ_c:

$$\lambda_c \, \partial^{\alpha} \, I_{\alpha} \; \neq \; 0 \,,$$

$$J^{\alpha\beta} \; = \; \left[\lambda_c \, \partial^{\alpha} \, I^{\beta} \; - \; \lambda_c \, \partial^{\beta} \, I^{\alpha} \right] \; \neq \; 0 \,. \tag{72}$$

$$\tilde{J}^{\alpha\beta} \; = \; \frac{1}{2} \, \varepsilon^{\alpha\beta\sigma\varrho} \, J_{\sigma\varrho} \neq \; 0 \,,$$

The analogy to a 4-vector of the text stream is possible to enter characteristics a 4-vector of context stream B^{α}:

$$\lambda_c \, \partial^{\alpha} \, B_{\alpha} \; \neq \; 0 \,,$$

$$H^{\alpha\beta} \; = \; \left[\lambda_c \, \partial^{\alpha} \, B^{\beta} \; - \; \lambda_c \, \partial^{\beta} \, B^{\alpha} \right] \; \neq \; 0 \,, \tag{73}$$

$$\tilde{H}^{\alpha\beta} \; = \; \frac{1}{2} \, \varepsilon^{\alpha\beta\varrho\sigma} \, H_{\varrho\sigma} \neq \; 0 \,.$$

Through the values certain thus can be expressed *a context emotion*, as the sum various composed, describing interaction between the text, implied sense and 4-vectors of text and implied sense streams:

$$\psi \; = \; \psi_0 \; + \; \psi_I \; + \; \psi_B + \; \psi_J \; + \; \psi_H \; + \; \psi_{IB} \; + \; \psi_{IJ} \; +$$
$$\psi_{BJ} \; + \; \psi_{IH} \; + \; \psi_{BH} \; + \; \psi_{JH} \,, \tag{74}$$

where ψ_0 – is certain by Eq. (71). The obvious forms of other composed are resulted below. The composed ψ_I characterizes the contribution in *context emotion* from a vector of the text stream in context, considering not only self-action of the given vector, but also possible changes and heterogeneity up to the second order inclusively:

$$\psi_I \; = \; I^{\nu} I_{\nu} \; + \; \lambda_c \, \partial^{\beta} I_{\beta} \; + \left(\lambda_c \, \partial^{\nu} I_{\nu} \right) \left(\lambda_c \, \partial^{\beta} I_{\beta} \right) \; +$$
$$\left(\lambda_c^2 \, \partial^2 I_{\sigma} \right) \left(\lambda_c^2 \, \partial^2 I^{\sigma} \right) \,. \tag{75}$$

The following composed ψ_B characterizes the contribution in *context emotion* from a vector of a context stream in a context, considering not only self-action of the given vector, but also its possible changes and heterogeneity up to the

second order inclusively:

$$
\begin{aligned}
\psi_B \;=\; & B^\nu B_\nu \;+\; \lambda_c\,\partial^{\,\beta} B_\beta \;+\; \left(\lambda_c\,\partial^{\,\nu} B_\nu\right)\left(\lambda_c\,\partial^{\,\beta} B_\beta\right) \;+\; \\
& \left(\lambda_c^2\,\partial^{\,2} B_\sigma\right)\left(\lambda_c^2\,\partial^{\,2} B^\sigma\right)\varrho\,,
\end{aligned}
\tag{76}
$$

The composed ψ_J characterizes the contribution in *context emotion* from antisymmetric tensor of the text stream in a context, at possible change and heterogeneity up to the second order inclusively:

$$
\begin{aligned}
\psi_J \;=\; & J^{\nu,\,\beta} J_{\nu,\,\beta} \;+\; \tilde{J}^{\nu,\,\beta} \tilde{J}_{\nu,\,\beta} \;+\; \frac{1}{2}\left[J^{\nu,\,\beta}\tilde{J}_{\nu,\,\beta} \;+\; \tilde{J}^{\nu,\,\beta} J_{\nu,\,\beta}\right] + \\
& \left(\lambda_c\,\partial^{\,\sigma} J_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma} J_\sigma^{\varrho}\right) \;+\; \left(\lambda_c\,\partial^{\,\sigma}\tilde{J}_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma}\tilde{J}_\sigma^{\varrho}\right) \;+\; \\
& \frac{1}{2}\left(\lambda_c\,\partial^{\,\sigma}\tilde{J}_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma} J_\sigma^{\varrho}\right) \;+\; \frac{1}{2}\left(\lambda_c\,\partial^{\,\sigma} J_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma}\tilde{J}_\sigma^{\varrho}\right).
\end{aligned}
\tag{77}
$$

The composed ψ_H characterizes the contribution in *context emotion* from antisymmetric tensor of context stream in a context, at possible change and heterogeneity up to the second order inclusively:

$$
\begin{aligned}
\psi_H \;=\; & H^{\nu,\,\beta} H_{\nu,\,\beta} \;+\; \tilde{H}^{\nu,\,\beta} \tilde{H}_{\nu,\,\beta} \;+\; \frac{1}{2}\left[H^{\nu,\,\beta}\tilde{H}_{\nu,\,\beta} \;+\; \tilde{H}^{\nu,\,\beta} H_{\nu,\,\beta}\right] + \\
& \left(\lambda_c\,\partial^{\,\sigma} H_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma} H_\sigma^{\varrho}\right) \;+\; \left(\lambda_c\,\partial^{\,\sigma}\tilde{H}_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma}\tilde{H}_\sigma^{\varrho}\right) \;+\; \\
& \frac{1}{2}\left(\lambda_c\,\partial^{\,\sigma}\tilde{H}_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma} H_\sigma^{\varrho}\right) \;+\; \frac{1}{2}\left(\lambda_c\,\partial^{\,\sigma} H_{\sigma,\,\varrho}\right)\left(\lambda_c\,\partial^{\,\sigma}\tilde{H}_\sigma^{\varrho}\right).
\end{aligned}
\tag{78}
$$

The composed ψ_{IB} considers possible contributions from interaction of vectors of text stream and context stream:

$$
\begin{aligned}
\psi_{IB} \;=\; & \frac{1}{2}\left[I^\nu B_\nu \;+\; B^\nu I_\nu\right] \;+\; \\
& \frac{1}{2}\left[\left(\lambda_c\,\partial^{\,\beta} I_\beta\right)\left(\lambda_c\,\partial^{\,\varrho} B_\varrho\right) \;+\; \left(\lambda_c\,\partial^{\,\varrho} B_\varrho\right)\left(\lambda_c\,\partial^{\,\beta} I_\beta\right)\right] \;+\; \\
& \frac{1}{2}\left[\left(\lambda_c^2\,\partial^{\,2} I_\varrho\right)\left(\lambda_c^2\,\partial^{\,2} B^\varrho\right) \;+\; \left(\lambda_c^2\,\partial^{\,2} B_\varrho\right)\left(\lambda_c^2\,\partial^{\,2} I^\varrho\right)\right].
\end{aligned}
\tag{79}
$$

The composed ψ_{IJ} considers possible contributions from interaction of text stream vectors and antisymmetric tensor of text stream, including contributions from change of interaction character between text stream vector, due to

antisymmetric tensor of text stream:

$$
\begin{aligned}
\psi_{IJ} \;=\; & k_1 \left[I_\nu\, J^{\nu,\,\beta}\, I_\beta \;+\; I_\nu\, \tilde{J}^{\nu,\,\beta}\, I_\beta \right] \;+\; \\
& \frac{k_1}{2} \left[\left(\lambda_c\, \partial^{\,\beta} J_{\beta,\,\sigma} \right) I^\sigma \;+\; I^\sigma \left(\lambda_c\, \partial^{\,\beta} J_{\beta,\,\sigma} \right) \right] \;+\; \\
& \frac{k_1}{2} \left[\left(\lambda_c\, \partial^{\,\beta} J_{\sigma,\,\beta} \right) I^\sigma \;+\; I^\sigma \left(\lambda_c\, \partial^{\,\beta} J_{\sigma,\,\beta} \right) \right] \;+\; \\
& \frac{k_1}{2} \left[\left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\beta,\,\sigma} \right) I^\sigma \;+\; I^\sigma \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\beta,\,\sigma} \right) \right] \;+\; \\
& \frac{k_1}{2} \left[\left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\sigma,\,\beta} \right) I^\sigma \;+\; I^\sigma \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\sigma,\,\beta} \right) \right] \;+\; \\
& k_1 \left(\lambda_c^2\, \partial^{\,2} I^\nu \right) J_{\nu,\,\beta} \left(\lambda_c^2\, \partial^{\,2} I^\beta \right) \;+\; \\
& k_1 \left(\lambda_c^2\, \partial^{\,2} I^\nu \right) \tilde{J}_{\nu,\,\beta} \left(\lambda_c^2\, \partial^{\,2} I^\beta \right) \;+\; \\
& \frac{k_1}{2} \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\beta,\,\nu} \right) \left(\lambda_c\, \partial^{\,\beta} J^\nu_{\;\beta} \right) \;+\; \\
& \frac{k_1}{2} \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\nu,\,\beta} \right) \left(\lambda_c\, \partial^{\,\beta} J^\nu_{\;\beta} \right) .
\end{aligned}
\tag{80}
$$

The composed ψ_{BJ} considers possible contributions from interaction of context stream vector and antisymmetric tensor of text stream, including contributions from change of interaction character between context stream vector, due to antisymmetric tensor of text stream:

$$
\begin{aligned}
\psi_{BJ} \;=\; & k_2 \left[B_\nu\, J^{\nu,\,\beta}\, B_\beta \;+\; B_\nu\, \tilde{J}^{\nu,\,\beta}\, B_\beta \right] \;+\; \\
& \frac{k_2}{2} \left[\left(\lambda_c\, \partial^{\,\beta} J_{\beta,\,\sigma} \right) B^\sigma \;+\; B^\sigma \left(\lambda_c\, \partial^{\,\beta} J_{\beta,\,\sigma} \right) \right] \;+\; \\
& \frac{k_2}{2} \left[\left(\lambda_c\, \partial^{\,\beta} J_{\sigma,\,\beta} \right) B^\sigma \;+\; B^\sigma \left(\lambda_c\, \partial^{\,\beta} J_{\sigma,\,\beta} \right) \right] \;+\; \\
& \frac{k_2}{2} \left[\left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\beta,\,\sigma} \right) B^\sigma \;+\; B^\sigma \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\beta,\,\sigma} \right) \right] \;+\; \\
& \frac{k_2}{2} \left[\left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\sigma,\,\beta} \right) B^\sigma \;+\; B^\sigma \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\sigma,\,\beta} \right) \right] \;+\; \\
& k_2 \left(\lambda_c^2\, \partial^{\,2} B^\nu \right) J_{\nu,\,\beta} \left(\lambda_c^2\, \partial^{\,2} B^\beta \right) \;+\; \\
& k_2 \left(\lambda_c^2\, \partial^{\,2} B^\nu \right) \tilde{J}_{\nu,\,\beta} \left(\lambda_c^2\, \partial^{\,2} B^\beta \right) \;+\; \\
& \frac{k_2}{2} \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\beta,\,\nu} \right) \left(\lambda_c\, \partial^{\,\beta} J^\nu_{\;\beta} \right) \;+\; \\
& \frac{k_2}{2} \left(\lambda_c\, \partial^{\,\beta} \tilde{J}_{\nu,\,\beta} \right) \left(\lambda_c\, \partial^{\,\beta} J^\nu_{\;\beta} \right) ,
\end{aligned}
\tag{81}
$$

The composed ψ_{IH} considers possible contributions from interaction of text stream vector and antisymmetric tensor of context stream, including contributions from change of interaction character between text stream vector, due to antisymmetric tensor of context stream:

$$
\begin{aligned}
\psi_{IH} \;=\; & k_1 \left[I_\nu \, H^{\,\nu,\beta} \, I_\beta \;+\; I_\nu \, \tilde{H}^{\,\nu,\beta} \, I_\beta \right] \;+ \\
& \frac{k_1}{2} \left[\left(\lambda_c \, \partial^{\,\beta} H_{\,\beta,\sigma} \right) I^{\,\sigma} \;+\; I^{\,\sigma} \left(\lambda_c \, \partial^{\,\beta} H_{\,\beta,\sigma} \right) \right] \;+ \\
& \frac{k_1}{2} \left[\left(\lambda_c \, \partial^{\,\beta} H_{\,\sigma,\beta} \right) I^{\,\sigma} \;+\; I^{\,\sigma} \left(\lambda_c \, \partial^{\,\beta} H_{\,\sigma,\beta} \right) \right] \;+ \\
& k_1 \left(\lambda_c^2 \, \partial^{\,2} I^{\,\nu} \right) H_{\,\nu,\beta} \left(\lambda_c^2 \, \partial^{\,2} I^{\,\beta} \right) \;+ \\
& k_1 \left(\lambda_c^2 \, \partial^{\,2} I^{\,\nu} \right) \tilde{H}_{\,\nu,\beta} \left(\lambda_c^2 \, \partial^{\,2} I^{\,\beta} \right) \;+ \\
& \frac{k_1}{2} \left(\lambda_c \, \partial^{\,\beta} \tilde{H}_{\,\beta,\nu} \right) \left(\lambda_c \, \partial^{\,\beta} H^{\,\nu}_{\,\beta} \right) \;+ \\
& \frac{k_1}{2} \left(\lambda_c \, \partial^{\,\beta} \tilde{H}_{\,\nu,\beta} \right) \left(\lambda_c \, \partial^{\,\beta} H^{\,\nu}_{\,\beta} \right) .
\end{aligned}
\tag{82}
$$

The composed ψ_{BH} considers possible contributions from interaction of context stream vector and antisymmetric tensor of context stream, including contributions from change of interaction character between context stream vector, due to antisymmetric tensor of context stream:

$$
\begin{aligned}
\psi_{BH} \;=\; & k_2 \left[B_\nu \, H^{\,\nu,\beta} \, B_\beta \;+\; B_\nu \, \tilde{H}^{\,\nu,\beta} \, B_\beta \right] \;+ \\
& \frac{k_2}{2} \left[\left(\lambda_c \, \partial^{\,\beta} H_{\,\beta,\sigma} \right) B^{\,\sigma} \;+\; B^{\,\sigma} \left(\lambda_c \, \partial^{\,\beta} H_{\,\beta,\sigma} \right) \right] \;+ \\
& \frac{k_2}{2} \left[\left(\lambda_c \, \partial^{\,\beta} H_{\,\sigma,\beta} \right) B^{\,\sigma} \;+\; B^{\,\sigma} \left(\lambda_c \, \partial^{\,\beta} H_{\,\sigma,\beta} \right) \right] \;+ \\
& k_2 \left(\lambda_c^2 \, \partial^{\,2} B^{\,\nu} \right) H_{\,\nu,\beta} \left(\lambda_c^2 \, \partial^{\,2} B^{\,\beta} \right) \;+ \\
& k_2 \left(\lambda_c^2 \, \partial^{\,2} B^{\,\nu} \right) \tilde{H}_{\,\nu,\beta} \left(\lambda_c^2 \, \partial^{\,2} B^{\,\beta} \right) \;+ \\
& \frac{k_2}{2} \left(\lambda_c \, \partial^{\,\beta} \tilde{H}_{\,\beta,\nu} \right) \left(\lambda_c \, \partial^{\,\beta} H^{\,\nu}_{\,\beta} \right) \;+ \\
& \frac{k_2}{2} \left(\lambda_c \, \partial^{\,\beta} \tilde{H}_{\,\nu,\beta} \right) \left(\lambda_c \, \partial^{\,\beta} H^{\,\nu}_{\,\beta} \right) .
\end{aligned}
\tag{83}
$$

In the Eqs. (80)–(83) are entered following multipliers k_1 and k_2 facing composed. Their obvious form has been presented through vectors of text stream

and context stream:

$$k_1 = 1 + I_\nu I^\nu + [\lambda_c \, \partial^\alpha I_\alpha] +$$
$$\left[\left(\lambda_c^2 \, \partial^2 I_\alpha\right)\left(\lambda_c^2 \, \partial^2 I_\alpha\right)\right] + \left[\lambda_c \, \partial^\beta I_\beta\right]^2 , \tag{84}$$

$$k_2 = 1 + B_\nu B^\nu + [\lambda_c \, \partial^\alpha B_\alpha] +$$
$$\left[\left(\lambda_c^2 \, \partial^2 B_\alpha\right)\left(\lambda_c^2 \, \partial^2 B_\alpha\right)\right] + \left[\lambda_c \, \partial^\beta B_\beta\right]^2 . \tag{85}$$

The composed ψ_{JH} considers possible contributions from interaction antisymmetric tensor of text stream and antisymmetric tensor of context stream:

$$\psi_{JH} = \frac{1}{2}\left[J^{\alpha,\beta} H_{\alpha,\beta} + H^{\alpha,\beta} J_{\alpha,\beta}\right] +$$
$$\frac{1}{2}\left[\tilde{J}^{\sigma,\varrho} \tilde{H}_{\sigma,\varrho} + \tilde{H}^{\sigma,\varrho} \tilde{J}_{\sigma,\varrho}\right] +$$
$$\frac{1}{2}\left[\tilde{J}^{\alpha,\beta} H_{\alpha,\beta} + H^{\alpha,\beta} \tilde{J}_{\alpha,\beta}\right] +$$
$$\frac{1}{2}\left[J^{\delta,\nu} \tilde{H}_{\delta,\nu} + \tilde{H}^{\delta,\nu} J_{\delta,\nu}\right] . \tag{86}$$

Through the values certain thus has been possible to express *implied sense*, as the sum of various contributions from the text interaction with 4-vector of stream::

$$\gamma = \gamma_\mu + \gamma_\psi + \gamma_{\mu\psi} + \gamma_x . \tag{87}$$

The composed γ_μ characterizes the contribution from changes and heterogeneity text emotions on which contributions to implied sense of the perceived text depend:

$$\gamma_\mu = \left(\lambda_c^2 \, \partial^2 \, \mu\right) + (\lambda_c \, \partial_\alpha \, \mu)(\lambda_c \, \partial^\alpha \, \mu) + \left(\lambda_c^2 \, \partial^2 \, \mu\right)\left(\lambda_c^2 \, \partial^2 \, \mu\right) . \tag{88}$$

The composed γ_ψ characterizes the contribution from changes and heterogeneity context emotions on which contributions to implied sense of perceived text to given context depend:

$$\gamma_\psi = \left(\lambda_c^2 \, \partial^2 \, \psi\right) + (\lambda_c \, \partial_\alpha \, \psi)(\lambda_c \, \partial^\alpha \, \psi) + \left(\lambda_c^2 \, \partial^2 \, \psi\right)\left(\lambda_c^2 \, \partial^2 \, \psi\right) . \tag{89}$$

The composed $\gamma_{\mu\psi}$ characterizes the contribution from interaction of changes and heterogeneity text and context emotions on which contributions to implied sense of the perceived text to the given context depend:

$$\gamma_{\mu\psi} = \frac{1}{2}\left[(\lambda_c \, \partial_\alpha \, \mu)(\lambda_c \, \partial^\alpha \, \psi) + (\lambda_c \, \partial_\alpha \, \psi)(\lambda_c \, \partial^\alpha \, \mu)\right] +$$
$$\frac{1}{2}\left[\left(\lambda_c^2 \, \partial^2 \, \mu\right)\left(\lambda_c^2 \, \partial^2 \, \psi\right) + \left(\lambda_c^2 \, \partial^2 \, \psi\right)\left(\lambda_c^2 \, \partial^2 \, \mu\right)\right] . \tag{90}$$

The composed γ_x characterizes the contribution from interaction of changes and heterogeneity text and a context emotions, and also vectors of a stream of the text and a context, at the account of possible contributions from antisymmetric tensors of text streams and a context on which contributions to implied sense of the perceived text to the given context expressed through the moments calculated in the given point of space depend:

$$\gamma_x = \frac{1}{2} \left(\frac{x_\alpha}{\lambda_c} \right) \left[(\lambda_c \, \partial^\alpha \, \mu) + (\lambda_c \, \partial^\alpha \, \psi) + I^\alpha + B^\alpha \right] +$$

$$\frac{1}{2} \left[(\lambda_c \, \partial_\alpha \, \mu) + (\lambda_c \, \partial_\alpha \, \psi) + I_\alpha + B_\alpha \right] \left(\frac{x^\alpha}{\lambda_c} \right) + \qquad (91)$$

$$\left(\frac{x_\alpha}{\lambda_c} \right) \left[J^{\alpha, \beta} + \tilde{J}^{\alpha, \beta} + H^{\alpha, \beta} + \tilde{H}^{\alpha, \beta} \right] \left(\frac{x_\beta}{\lambda_c} \right).$$

The apparently from the resulted parities for contributions to the *GIE* the account of self-action leads, complex and heterogeneity under contributions, structure of the *GIE*. However, at the decision of specific targets, the part from this composed can not be considered, proceeding from conditions of a problem. So, for example at uniformity text perception components of tensors, disappear both contributions to context and implied sense of text and the *GIE* depends only on emotion of text.

6   The description of free information transference

The before to consider free information transference model have necessary to consider that fact, that absolutely free information transference does not represent interest as the information cannot be characterized by the *GIE*, by virtue of absence of information perception subject. The free information transference has understood information perception for the other information lack. The further has considered a method of processes description at the free information transference.

The 4-DPEIS general postulates considered earlier and formal structure *GIE* description, probably to consider the question on free information transference in 4-DPEIS. The information transference to 4-DPEIS has chance quantity, i.e. the information position in the given 4-DPEIS point x_b^α can be found with some probability of initial point x_a^α transition:

$$\Omega \left(x_b^{\,\alpha}, \ x_a^{\,\alpha} \right) = \left| K \left(x_b^{\,\alpha}, \ x_a^{\,\alpha} \right) \right|^2 = K \left(x_b^{\,\alpha}, \ x_a^{\,\alpha} \right) K^* \left(x_b^{\,\alpha}, \ x_a^{\,\alpha} \right), \qquad (92)$$

where $K \left(b, \ a \right)$ – is generally complex amplitude of transition from a point x_a^α to a point x_b^α, $K^* \left(b, \ a \right)$ – is complexly interfaced amplitude. For transition amplitude calculation has used method continual integrals of Feynman from

action function [75]. Thus, action for free transference information is defined through a 4-vector of momentum:

$$S_0\left(x_b^{\ \alpha},\ x_a^{\ \alpha}\right) = \int\limits_{x_a^{\ \alpha}}^{x_b^{\ \alpha}} \mathfrak{L}_0\ d\tau = -\int\limits_{x_a^{\ \alpha}}^{x_b^{\ \alpha}} p^{\ \alpha}\ dx_{\ \alpha}\,. \qquad (93)$$

The transition amplitude between points $x_a^{\ \alpha}$ and $x_b^{\ \alpha}$ was possible to calculate as integral on all possible paths from action function, where as a constant has been used the certain value of information constant $\hbar_c$ Eq. (60):

$$K\left(x_b^{\ \alpha},\ x_a^{\ \alpha}\right) = \frac{1}{N_\infty}\int\limits_\Gamma \exp\left[-\frac{i}{\hbar_c}S_0\left(x_b^{\ \alpha},\ x_a^{\ \alpha}\right)\right]\prod\limits_{x_{\ i}^{\ \alpha}}\frac{d^{\ 4}p\left(x_{\ i}^{\ \alpha}\right)\ d^{\ 4}x\left(x_{\ i}^{\ \alpha}\right)}{8\ \pi^4}\,, \qquad (94)$$

where Γ – is a of phase space volume in which there is the information transference on all possible paths; $x_{\ i}^{\ \alpha}$ – is carried out i-partition number of information position 4-vector in 4-DPEIS, partition trajectory which moving the information from initial point $x_a^{\ \alpha}$ in finite point $x_b^{\ \alpha}$, it essentially depends on partition paths; $d^{\ 4}p\left(x_i^{\ \alpha}\right)\ d^{\ 4}x\left(x_i^{\ \alpha}\right)$ – is corresponding i-partition number to that splitting of phase 4-volume paths elements in momentum and coordinate spaces; N_∞ – is normalizing constant which can be defined from normalizing condition on unit of probability in all 4-DPEIS:

$$K\left(\Gamma_\infty\right)\ =\ \int\limits_{\Gamma_\infty} \exp\left[-\frac{i}{\hbar_c}\ S_0\left(x_b^{\ \alpha}, x_a^{\ \alpha}\right)\right]\prod\limits_{x_i^{\ \alpha}}\frac{d^{\ 4}p\left(x_i^{\ \alpha}\right)\ d^{\ 4}x\left(x_i^{\ \alpha}\right)}{8\ \pi^4}\,,$$

$$\left|\frac{1}{N_\infty}\ K\left(\Gamma_\infty\right)\right|^2\ =\ \frac{1}{N_\infty N_\infty^*}\ K\left(\Gamma_\infty\right)K^*\left(\Gamma_\infty\right)\ =\ 1\,, \qquad (95)$$

where Γ_∞ – is all 4-volume in 4-DPEIS of the given information extends on all possible paths. The obvious form of paths integral have calculated between two points $x_a^{\ \alpha}$ and $x_b^{\ \alpha}$ of Eq. (94) which defines amplitude of information transition, and then obvious form of normalizing constant have calculate for free information transference frame of Eq. (95). The calculation of paths integral is spent by partition each path into such sites, where $p^{\ \alpha}\left(x_{\ i}^{\ \alpha}\right)$ – is constant everyone i-partition number, $x^{\ \alpha}\left(x_{\ i}^{\ \alpha}\right)$ – is varies linearly, the M parts number for each of paths will depend on away partition, nevertheless, in a limit at $M\ \to\ \infty$ the following obvious forms is received for continual integral:

$$K\left(b,\ a\right) = \frac{1}{N_\infty}\int\limits_\Gamma \exp\left[-\frac{i}{\hbar_c}\ p_{\ \alpha}\left(x_b^{\ \alpha}\ -\ x_a^{\ \alpha}\right)\right]\frac{d^{\ 4}p}{8\ \pi^4}\,. \qquad (96)$$

The integral of Eq. (96) will be possible calculate, knowing an obvious form of 4-vector of momentum $p^{\ \alpha}$. For calculation of mean value is necessary know in obvious form 4-density of the information transition probability from initial

trajectory in final point. For this purpose have considered probability of such transition Eq. (92) and have find density of probability in coordinate space:

$$
\rho\left(x_b^{\alpha},\ x_a^{\alpha}\right)\ =\ \frac{d\,\Omega\left(x_b^{\alpha},\ x_a^{\alpha}\right)}{d^{\,4}x}\ =
$$
$$
\frac{d\,K\left(x_b^{\alpha},\ x_a^{\alpha}\right)}{d^{\,4}x}K^{*}\left(x_b^{\alpha},\ x_a^{\alpha}\right)+K\left(x_b^{\alpha},\ x_a^{\alpha}\right)\frac{d\,K^{*}\left(x_b^{\alpha},\ x_a^{\alpha}\right)}{d^{\,4}x}\ . \tag{97}
$$

The received definition of probability density can be used at calculation of mean from observable values: 4-vectors of information displacement, a 4-vector of momentum, etc. Also the given expression Eq. (97) can be used for updating model parameters in requirements view in the theorem 2, i.e. at calculation of mean displacement in 4-DPEIS:

$$
\langle\left(x_b^{\alpha}\ -\ x_a^{\alpha}\right)\rangle = \int_{\Gamma}\left(x_b^{\alpha}\ -\ x_a^{\alpha}\right)\rho\left(x_b^{\alpha},\ x_a^{\alpha}\right)\ d^{\,4}x\ . \tag{98}
$$

The method offered in the given paragraph can be used for characteristics renewal of free information apprehended by the subject of information perception: knowledge of obvious two information characteristics forms, such as the *GIE* of Eq. (63), tensor of text of Eq. (64) and tensor of text perception of Eq. (65) allows to calculate all three characteristics and to calculate depending from them observable.

In the given section the basic moments of the free information transference description in 4-DPEIS and calculations are considered the characteristics related, and also the normalizing constant which can be used in the further is calculated. In the further shall consider the problem on information transference at interference on it of other information.

7   The description of information interaction and transference

The considering 4-DPEIS calculating information interaction characteristics is necessary to consider, that interference of information occurs concerning one subject of perception of the information, in frame of if there are some subjects of perception of the information that interference of information occurs due to information interchange between these subjects. The consideration of information interference leads to that concerning one subject, at information difference perception could be considered of information concerning of one information perception tensor of Eq. (65). The observable values for information interaction have chance quantity, therefore for calculations is necessary for us to know processes probability and probability density.

For calculation of system transition probability from some initial point x_a^{α} in final point x_b^{α} in 4-DPEIS space is come return to consideration Lagrangian of two interaction information system of Eq. (58). The Lagrangian of two interaction information system was entered the effective 4-vector of momentum, taking into account of Eq. (59):

$$P^{\alpha} = Q_c\, \nu_c\, \left(n_+\, q_+ \left[f\, \beta_{\alpha +} + \frac{q_{12}}{[s\,(x^{\alpha})]^2}\, a^{\alpha} \right] \right)\,. \qquad (99)$$

For total 4-velocity of system is entered designation still in addition of Eq. (59):

$$v^{\alpha} = \nu_c\, \beta_{\alpha +}\,. \qquad (100)$$

The result was accepted following form for Lagrangian of two interaction information system:

$$\mathfrak{L}_{int} = P^{\alpha}\, v_{\alpha}\,. \qquad (101)$$

The system transition probability of two information interaction, as well as in frame of free transference, is defined through complex amplitude:

$$\Omega_{int}\,(x_b^{\alpha},\, x_a^{\alpha}) = K_{int}\,(x_b^{\alpha},\, x_a^{\alpha})\, K_{int}^{*}\,(x_b^{\alpha},\, x_a^{\alpha})\,, \qquad (102)$$

where $K_{int}\,(b,\, a)$ – is a complex amplitude of two information system transition from point x_a^{α} in point x_b^{α}, $K^{*}\,(b,\, a)$ – is complex conjugate amplitude. For calculation of transition amplitude is used continual integrals method from action function, offered Feynman [75]. Thus action for free transference information is defined through 4-vector of momentum:

$$S_{int}\,(x_b^{\alpha},\, x_a^{\alpha}) = \int\limits_{x_a^{\alpha}}^{x_b^{\alpha}} \mathfrak{L}_{int}\, d\tau = -\int\limits_{x_a^{\alpha}}^{x_b^{\alpha}} P^{\alpha}\, dx_{\alpha}\,. \qquad (103)$$

The two information transition amplitude between points x_a^{α} and x_b^{α} is possible to calculate as path integral from action function, where as a constant is used earlier the information constant certain value $\hbar_c$ of Eq. (60):

$$K\,(x_b^{\alpha},\, x_a^{\alpha}) = \frac{1}{N_{\infty}} \int\limits_{\Gamma} \exp\left[-\frac{i}{\hbar_c} S_{int}\,(x_b^{\alpha},\, x_a^{\alpha}) \right] \prod_{x_i^{\alpha}} \frac{d^4 P\,(x_i^{\alpha})\, d^4 x\,(x_i^{\alpha})}{8\,\pi^4}\,, \qquad (104)$$

where Γ – is phase space volume is information transference on all possible paths; x_i^{α} – is i-partition number of information position 4-vector in the 4-DPEIS, describing path on which moving information is carried out from initial point x_a^{α} to finite point x_b^{α}, essentially is depends approach of partition paths, $d^4 P\,(x_i^{\alpha})$ and $d^4 x\,(x_i^{\alpha})$ – corresponding i-partition number of phase 4-volume parting elements in momentum and coordinate spaces; N_{∞} – in frame of a free information system, i.e. systems without interference, normalizing constant of

Eq. (95) which have defined from normality condition on probability unit in all 4-DPEIS.

Let's obvious form of path integral calculate which defines two information transition amplitude between two points x_a^α and x_b^α of Eq. (104), and normalizing constant of Eq. (95) for free information transference frame have calculate obvious form. The calculation of paths integral is spent by parting each path into such part, i.e. also as well as in frame of free information transference, where $P^\alpha(x_i^\alpha)$ – is constant everyone i-partition number into such part, $x^\alpha(x_i^\alpha)$ – varies linearly, the M parts number for each of paths will depend on away partition, for each of paths will depend on away partition, nevertheless, in a limit at $M \to \infty$ the following obvious forms is received for continual integral:

$$ K(b, a) = \frac{1}{N_\infty} \int_\Gamma \exp\left[-\frac{i}{\hbar_c} P_\alpha(x_b^\alpha - x_a^\alpha)\right] \frac{d^4 P}{8 \pi^4}. \qquad (105) $$

The integral of Eq. (105) calculating is necessary solve for obvious form of 4-vector of effective momentum P^α. However is possible pass from 4-volume integration element of effective momentums in phase space, get 4-vector of momentum and 4-vector of interference potential obvious forms.

For calculation of mean values are necessary us known probability 4-density in obvious form of information transition from initial path in finite point. For this purpose has considered probability of Eq. (92) such transition and found probability 4-density in coordinate space:

$$ \rho(x_b^\alpha, x_a^\alpha) = \frac{d\,\Omega_{int}(x_b^\alpha, x_a^\alpha)}{d^4 x} = $$
$$ \frac{d\,K(x_b^\alpha, x_a^\alpha)}{d^4 x} K^*(x_b^\alpha, x_a^\alpha) + K(x_b^\alpha, x_a^\alpha) \frac{d\,K^*(x_b^\alpha, x_a^\alpha)}{d^4 x}. \qquad (106) $$

The received definition of probability 4-density can be used at calculation of averages from observable values: 4-vectors of information displacement, 4-vector of momentum, etc. Also the given of Eq. (106) can be used for updating parameters of model in requirements view in the theorem 2.

The paragraph conclusions will lead classification of arising problems by information interference, under processing condition of these information (it is corresponding texts tensors of Eq. (64)) by means of one information perception tensor of Eq. (65), i.e. the perception of the information is made by one subject [4,5,6,8,9,10,11,12,13,14,15,16,17,18,23,24,25,26,27,28,29,30,31,47,48,49,50,51,52,53,54,55,56,57,58,59,60

(1) The problem of information transference under other information interaction is primary goal about information interference, when by known obvious form of tensor of text perception and tensor of texts participat-

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ing in interference, the *GIE* obvious form of Eq. (63). The offered method will be calculating probability of information transference and probability 4-density and also will be possible to calculate all observable parameters, when knowing velocity of information transference in 4-DPEIS.

(2) The return problem of information transference under other information interaction: knowing *GIE* obvious form observable parameters of information interference, and also obvious form of tensor of text perception and one of tensor of text and one only of two tensor of texts participating in interference will be possible to restore accordingly initial tensor of text or tensor of text perception. The same problem will be carried problem of generation new tensor of text under interaction of apprehended text.

(3) The problem of formation information perception tensor (the problem of the subject training): unlike a problem of renewal information perception tensor could be used tensor of texts with in advance known *GIE* and on them correct value *GIE* for each of giving separately texts will be calculated the tensor of text perception.

(4) The problem of information dispersion will be problem existence of information barrier to information perception.

8   Results and conclusions

So, in this article the direction of construction of information space is considered as 4-DPEIS where time is the value equivalent to time in physical system with which the information is related. Thus we can make following statements:

(1) criteria of existence *LIV* of Eq. (1) are found and value determined is presented in the theorem 1

(2) On the basis of existence *LIV* can enter 4-DPEIS, on which the Poincares group of transformations determined for *LIV* of (1) is realized

(3) criteria of the information displacement in information space in the theorem 2 which establish communication between mean time, are determined by mean velocity and the information displacement .

(4) For the description of information dynamics and interaction is entered the generalizing parameter — *GIE*, the basic components, giving the contribution to this parameter, and the equations relating this parameter with parameters of model are considered.

(5) the description of free information transference and interference of two and more information in information space is considered. The basic classification of problems is resulted.

The considered direction of modelling of information space can be applied without the generality limitations to the description of any real systems for which studying information making system is important and thus the account

of processes of the various nature, for example, physical and sociological processes is required. The given direction of of information space modelling allows to consider, on the one hand, objective parameters of the information, on the other hand, allows to consider within the limits of the approach subjective features of perception of the information. The important question at modelling information space, and also the text and the tensor of text perceptions is a correct comparison of the phenomena and processes proceeding in physical (chemical, biological, social, etc.) system with three-dimensional coordinates of information space and components the tensor of text and tensor of text perception. As a whole, apparently to the author, the given relativistic direction of the modelling description of information space and information systems has greater prospects from the point of view of the description of information processes in one language and without dependence from type of considered system or especially their combinations.

Acknowledgements

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